Maintenance Guide

MOTOR GRADERS

No12 No112 No212

1
Mainten
CATERPILLAR
2
YOU'VE COME TO GET YOUR NEW NO.12— IT'S READY TO GO TO WORK.
WE SURE HAVE PLENTY OF WORK FOR IT!
3
DID YOU KNOW THAT MORE THAN 99% OF ALL MOTOR-GRADERS BUILT BY "CATERPILLAR" ARE STILL AT WORK?
YES. THAT'S ONE OF THE REASONS WE BOUGHT A "CAT."

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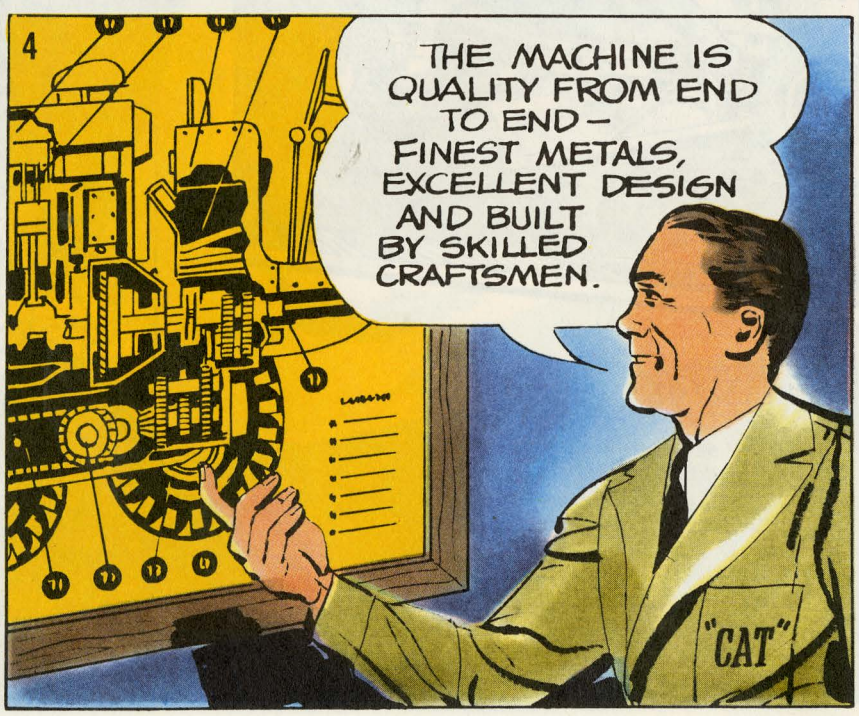
ance Guide

MOTOR GRADERS NO.12 NO.112 NO.212

Farm-to-market roads—construction jobs—snow removal—logging roads—terracing—oilfield roads—mining properties—and hundreds of other operations depend upon "Caterpillar" Motor Graders and their operators to keep the "wheels-of-progress" turning. *The quality of each job is related to the skill of the operator and the condition of his Motor Grader.*

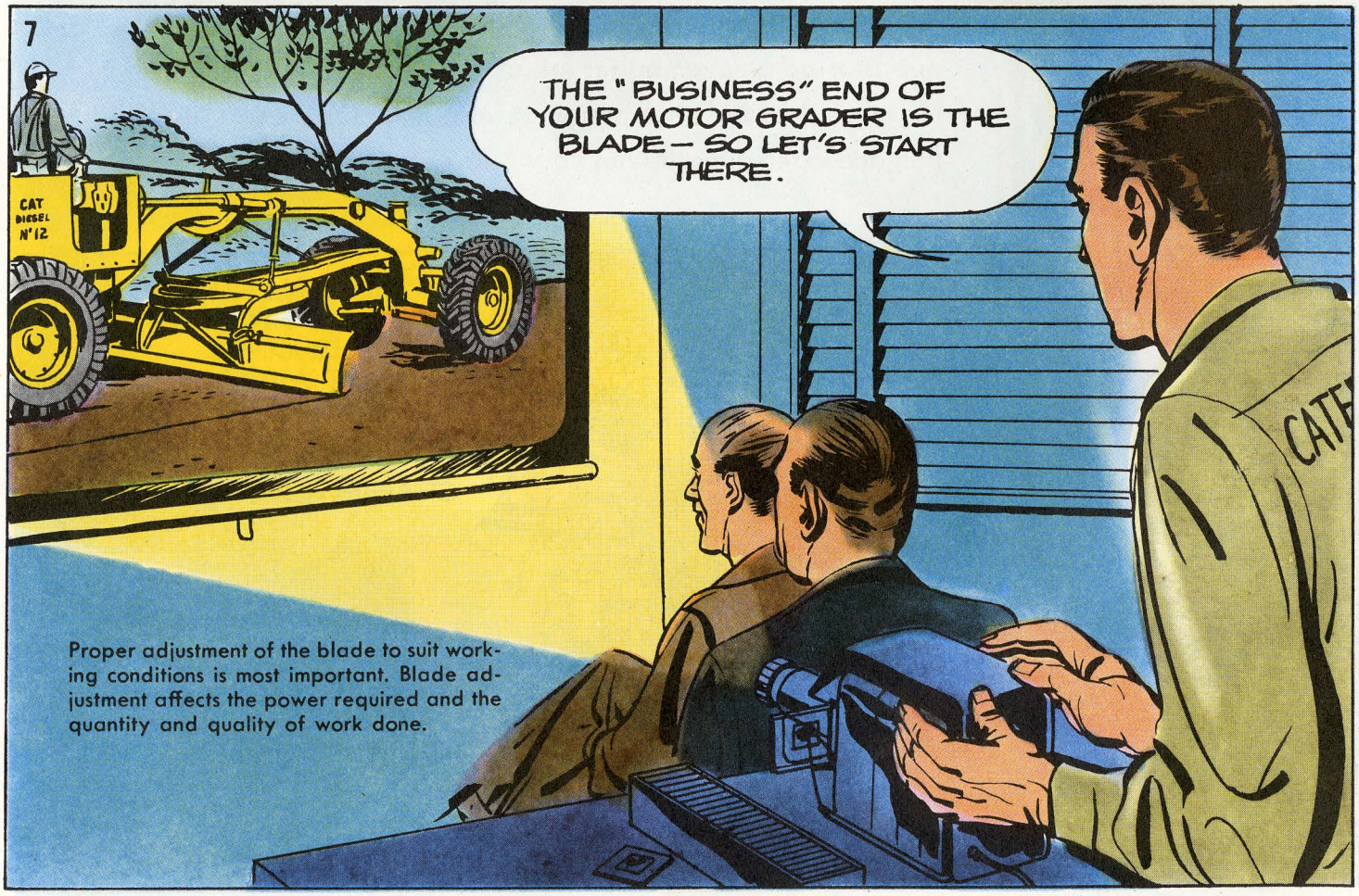
Skill comes with experience and practice. Equipment condition is the result of proper maintenance and care.

This Maintenance Guide has been prepared to help each operator do an even better job of caring for his Motor Grader. For more detailed information, refer to your Operator's Instruction Book and consult with your "Caterpillar" Dealer.



5
BUT- REGARDLESS OF ALL ITS QUALITY, MAXIMUM SERVICE DEPENDS LARGELY ON THE CARE GIVEN TO IT BY ITS OPERATOR.
ERPILLAR

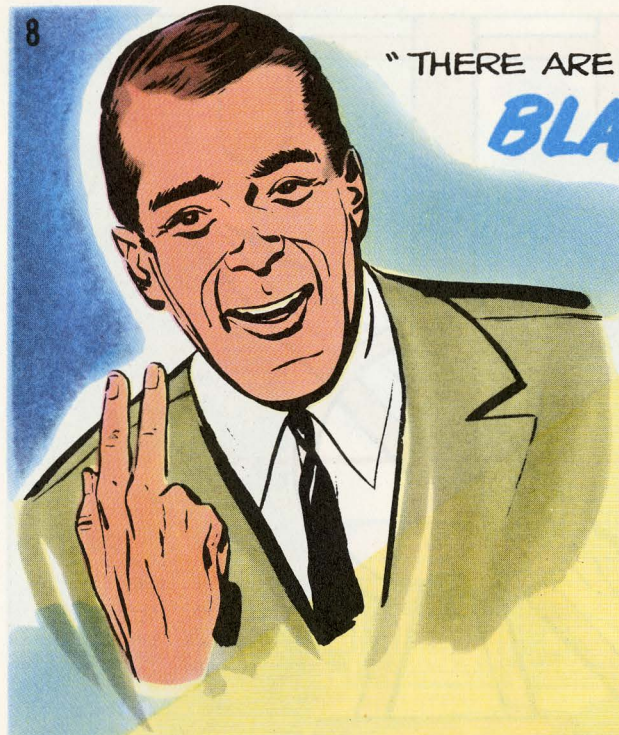
6
LET ME SHOW YOU SOME PICTURES AS AN EXAMPLE OF GOOD MAINTENANCE.
OKEY! WE WANT TO LEARN EVERYTHING THERE IS TO KNOW ABOUT THAT MACHINE.

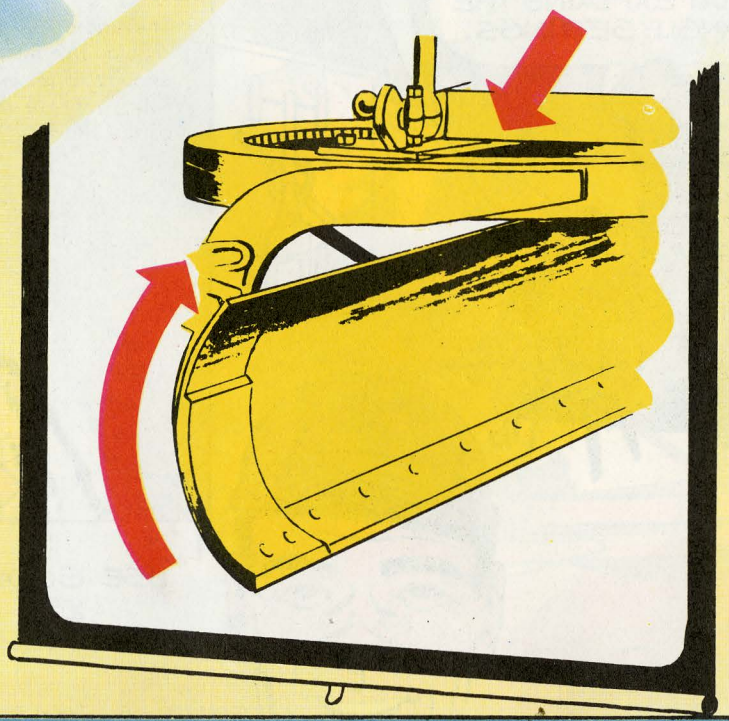

7
THE "BUSINESS" END OF YOUR MOTOR GRADER IS THE BLADE — SO LET'S START THERE.
CAT DIESEL N°12
Proper adjustment of the blade to suit working conditions is most important. Blade adjustment affects the power required and the quantity and quality of work done.

"THERE ARE TWO PRINCIPAL

BLADE ADJUSTMENTS—

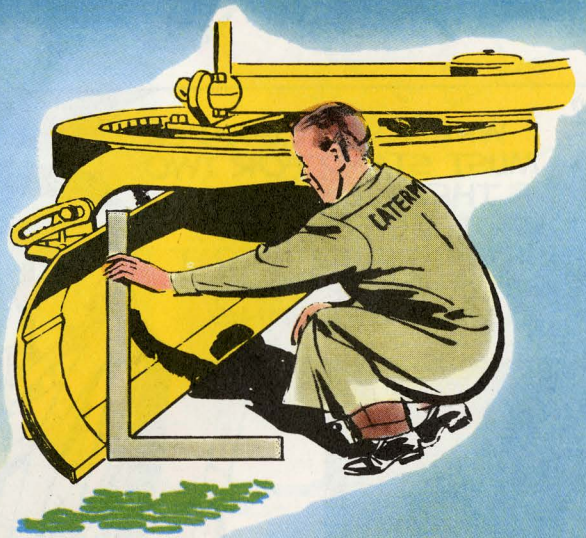
PITCH AND ANGLE."

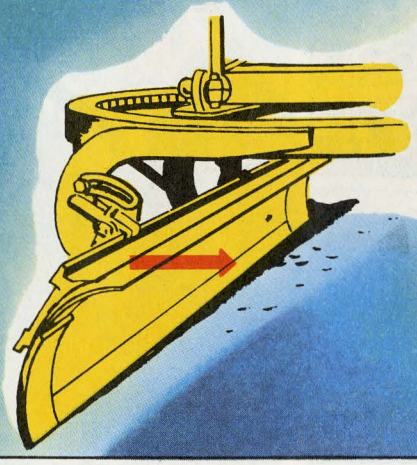




PITCH must allow the blade to cut or mix—or to drag as desired.

The blade is designed so that the most effective cutting pitch and also rolling action is obtained when the cutting edge is directly below the top of the moldboard. *This vertical setting is used in grading and reshaping.*





For road maintenance, tilt the blade forward at the top to a dragging or scraping pitch.

9

WHAT'S THE BEST ANGLE FOR THOSE PITCHES?

HERE'S A SLIDE THAT EXPLAINS THE ANGLE SETTINGS.

10

The angle *for grading* should be just sharp enough to let material roll freely off the end of the blade.

ANGLE

For dragging, the angle should be between 20° and 30°.

11

"USE GOOD JUDGMENT IN APPLYING **BLADE PRESSURE**"

Long before maximum pressure is applied, the blade is working to its full capacity.

12

WHEN YOUR GRADER MUST STAND FOR TWO OR THREE DAYS, PROTECT THE BLADE SURFACE WITH A COAT OF OIL OR GREASE. PREVENT RUSTING.

13

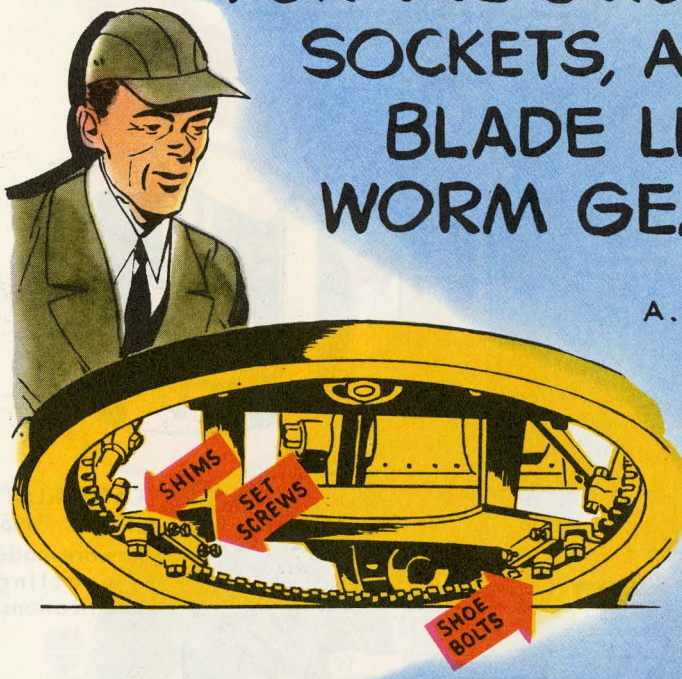
Minimum clearance of circle supporting shoes and blade lift ball joints helps to prevent blade chatter.

LET'S GO OUTSIDE TO YOUR MACHINE. I'D LIKE TO SHOW YOU THE ADJUSTMENTS FOR THE CIRCLE, BALL AND SOCKETS AND BLADE LIFT WORM GEARS.

"CAT"

"HERE ARE THE **WEAR ADJUSTMENTS**

FOR THE CIRCLE, BALL AND SOCKETS, AND BLADE LIFT WORM GEARS."



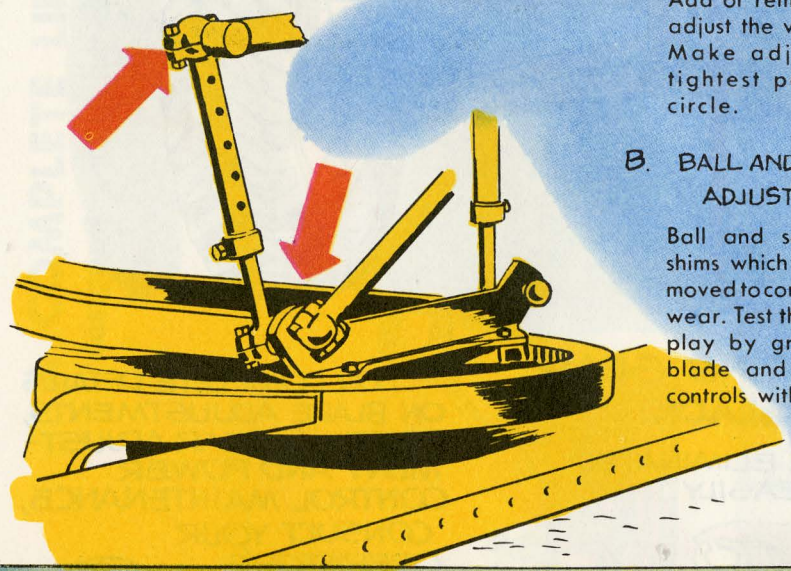
A. CIRCLE ADJUSTMENT

Side Play

Loosen shoe bolts and the set screw lock nuts. Turn the set screws down tight and back-off until circle turns freely. *Adjust both circle guides an equal amount.*

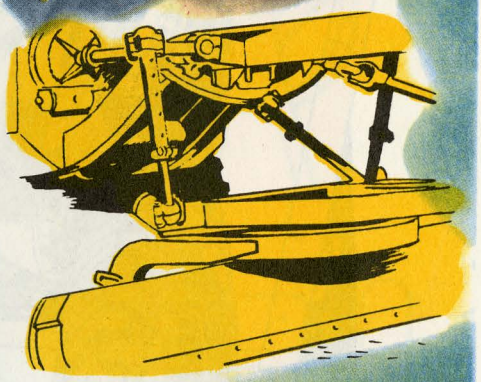
Vertical Play

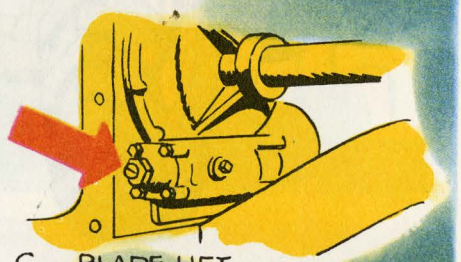
Add or remove shims to adjust the vertical play. Make adjustment at tightest point on the circle.



B. BALL AND SOCKETS ADJUSTMENTS

Ball and sockets have shims which may be removed to compensate for wear. Test the amount of play by grounding the blade and moving the controls without load.





C. BLADE LIFT WORM GEARS

To adjust for wear, rotate the lift arms so the weight of the blade is on the ground. Loosen the lock nut and turn the screw in snugly.

15

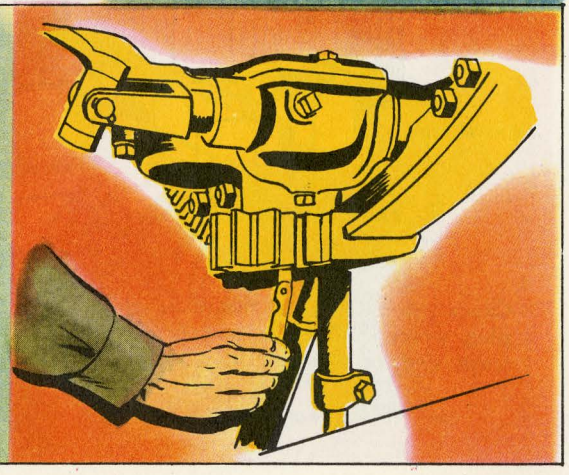
AND, THERE IS A WEAR ADJUSTMENT ON THE CENTER SHIFT CONTROL PINION FOR LATE MODEL MOTOR GRADERS.

To adjust backlash—

A. Check backlash between the pinion gear and rack teeth. (Backlash should be .030 in.)

B. If average backlash is more than .060 inches remove shims.

C. Refer to your Operator's Instruction Book for details.

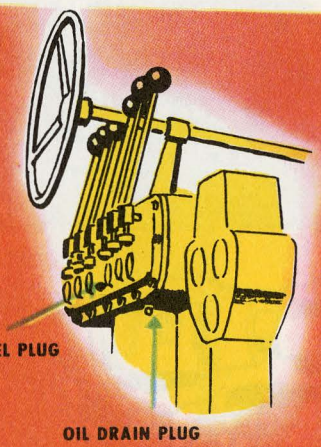


16 "THE POWER CONTROLS REQUIRE ONLY PERIODIC ATTENTION!"

The power control levers should be operated with a quick firm push or pull that will fully engage the controls.

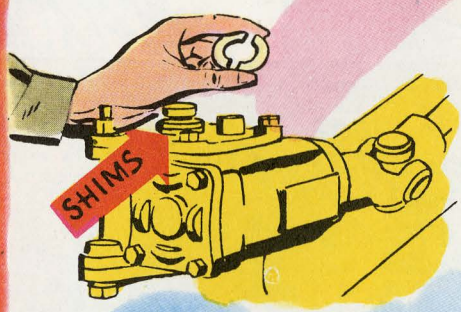
The SHEAR PIN has sufficient strength to withstand normal expected operation. When abnormal shocks occur, the pin shears; thus preventing damage to the controls. ONLY USE "CATERPILLAR" SHEAR PINS. They are made to exacting specifications.

17



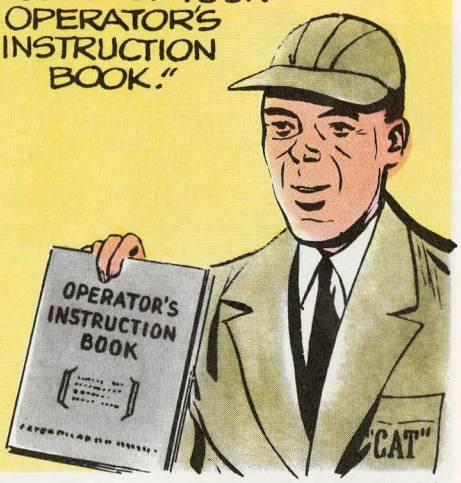
Check the oil level at the oil level plug every 120 hours and drain, wash and refill every 900 hours.

18 STEERING GEAR SLACK MAY BE ELIMINATED EASILY.



Remove shims to take up slack. The arm shaft nut should fit firmly and the steering mechanism should work freely.

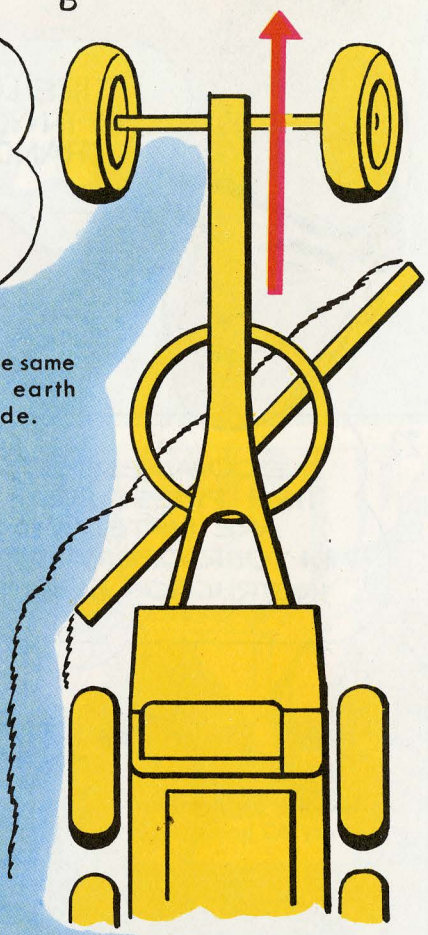
19 "FOR COMPLETE DETAILS ON BLADE ADJUSTMENTS, STEERING GEAR ADJUSTMENT AND POWER CONTROL MAINTENANCE, CONSULT YOUR OPERATOR'S INSTRUCTION BOOK!"



FRONT WHEELS

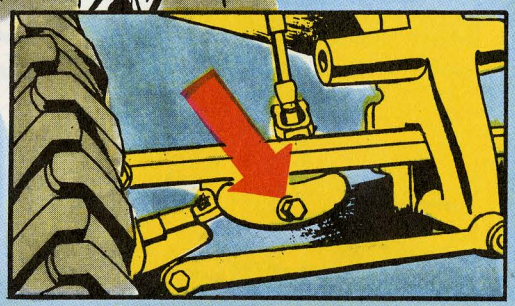
A

B



Lean the wheels in the same direction that the earth moves off the blade.

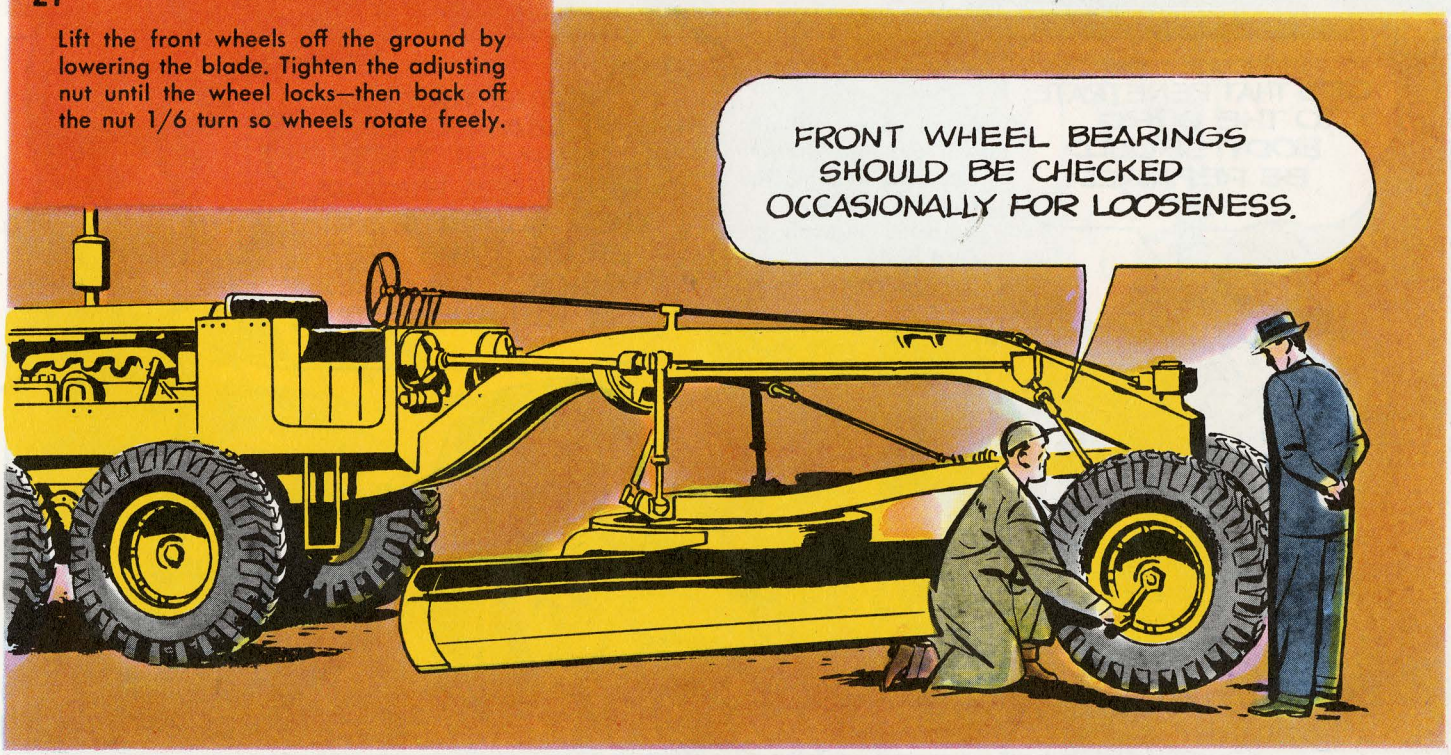
C



When traveling over long distances at high speeds, or with front mounted equipment, install the capscrew. Remove this capscrew before operating the "front wheel lean control lever."

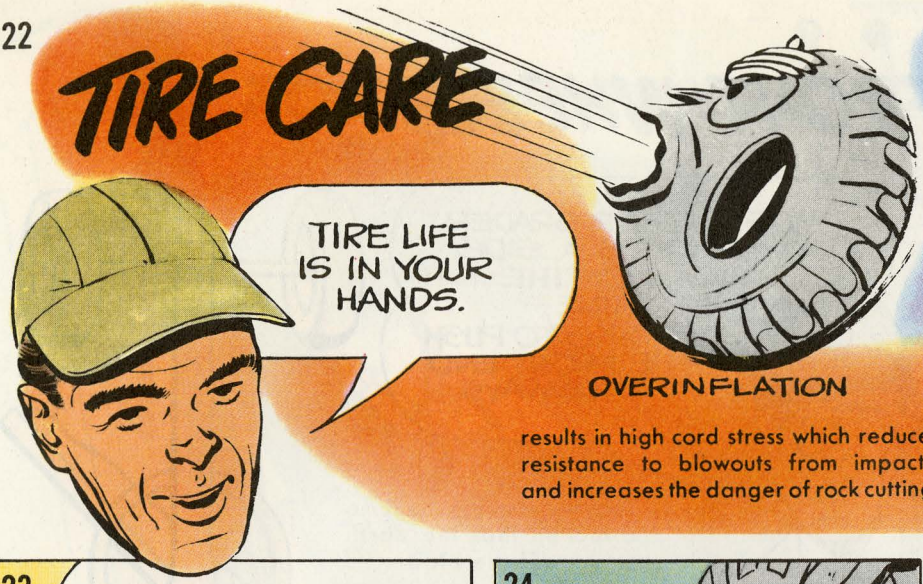
21

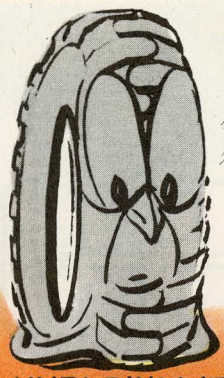
Lift the front wheels off the ground by lowering the blade. Tighten the adjusting nut until the wheel locks—then back off the nut 1/6 turn so wheels rotate freely.



22

TIRE CARE





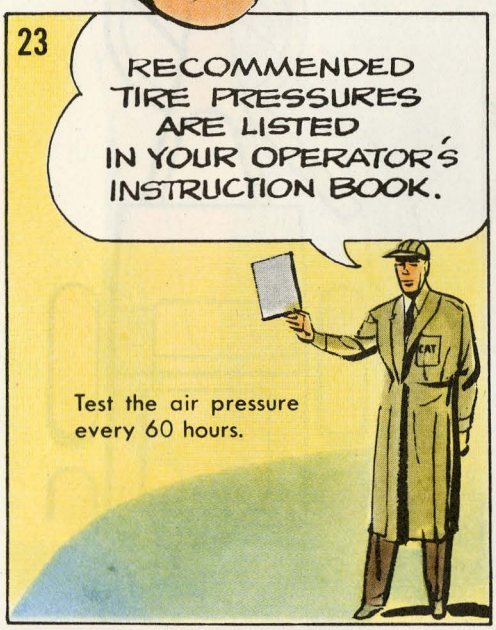
OVERINFLATION

results in high cord stress which reduces resistance to blowouts from impacts, and increases the danger of rock cutting.

UNDERINFLATION

causes uneven tread wear, sidewall radial cracks, ply separation and loose or broken cords inside the tire.

23



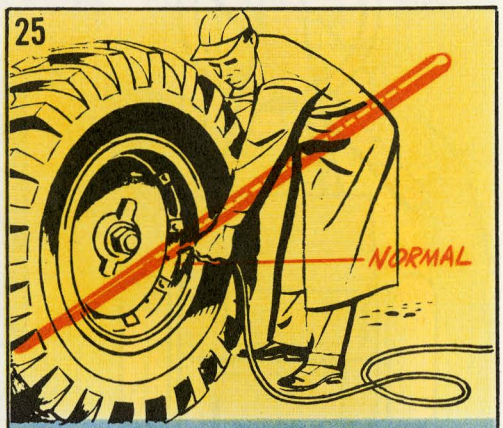
Test the air pressure every 60 hours.

24

Don't bleed tires to correct the pressure "build-up" from operation.

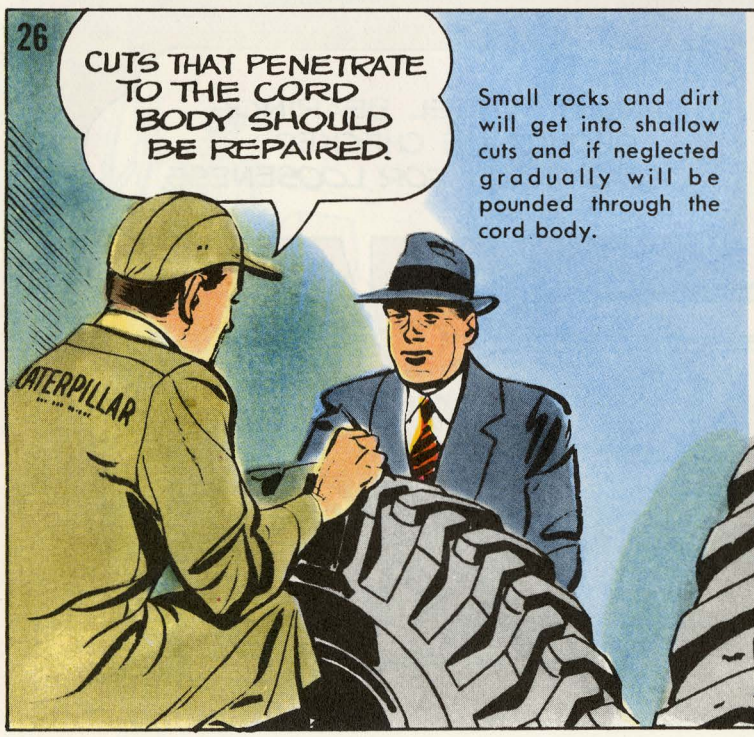
Reducing the air pressure will result in dangerous underinflation when the equipment stops at the end of the day and the tires cool off.

25



And, practice *Safety!* To avoid possible personal injury, inflate tires from a safe position. Check and correct air pressures only when tires are at normal temperatures.

26



Small rocks and dirt will get into shallow cuts and if neglected gradually will be pounded through the cord body.

27

IF THE TIRE HAS AT LEAST ONE DEEP CUT THAT REQUIRES REPAIR, THEN ALL THE SMALLER CUTS MAY BE QUICKLY AND CHEAPLY REPAIRED, TOO.

28

FRONT WHEELS SHOULD BE ALIGNED PROPERLY AND HAVE THE CORRECT TOE-IN OF 1/8 INCH, FOR MAXIMUM TIRE LIFE.

29

KEEP TIRES FREE OF OIL.

Oil softens and tends to devulcanize the rubber—causing tires to deteriorate rapidly. If possible, use old tires when working in oil mix.

30

BRAKES-

"THEY'RE MIGHTY IMPORTANT WHEN YOU NEED THEM."

SCRREEEECH

31

To adjust brakes, remove the adjusting screw hole cover and the thickness gauge hole covers. Brake lining wear is adjusted at the lower ends of the shoes

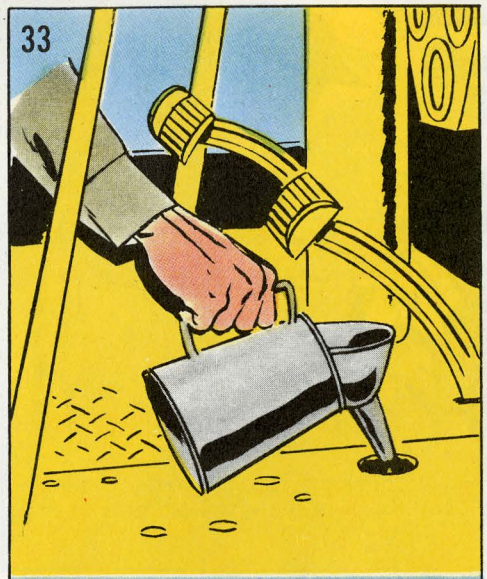
32

Loosen the two centralizer bolt nuts enough to relieve the lockwasher tension.

Use adjusting tool and expand brake linings tightly against the brake drum. Now, tighten the centralizer nuts.

Loosen adjusting screw until .020 thickness gauge can be inserted between the linings and the drum.

33



Use recommended brake fluids in the master cylinder. Fill within ½-inch of bottom of filler plug.

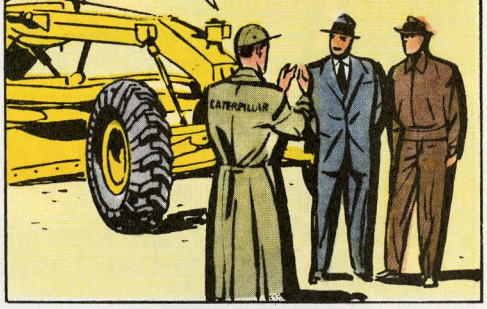
34

FOR DETAILS ON HAND BRAKE ADJUSTMENT, REFER TO YOUR OPERATOR'S INSTRUCTION BOOK.

35

HOW ABOUT THE CLUTCH?

AS THE **FLYWHEEL CLUTCH** LININGS WEAR, FREE MOVEMENT OF THE CLUTCH PEDAL DECREASES.



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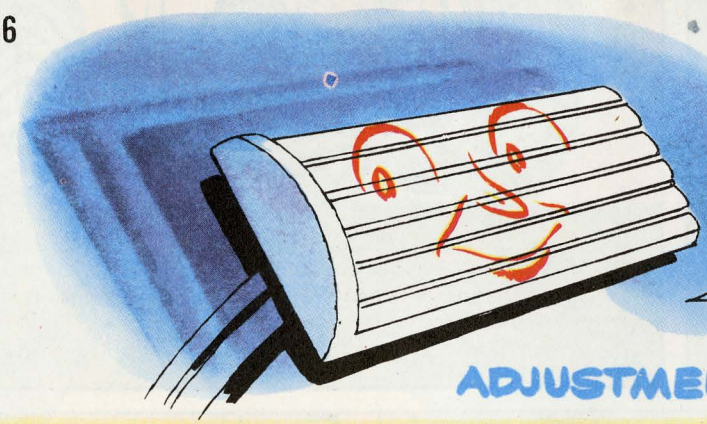


I NEED 3 INCHES OF FREE MOVEMENT

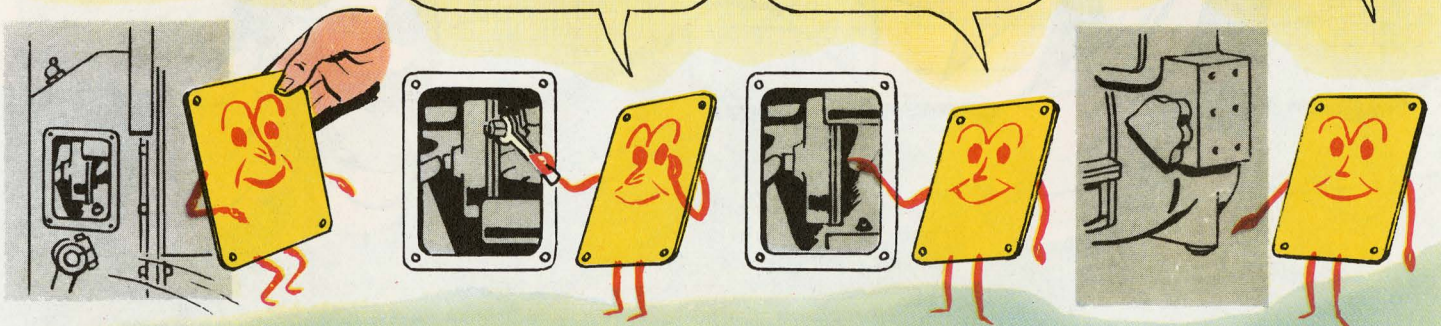
ADJUSTMENT STEPS

TAKE ME OFF!

REMOVE COTTER PINS FROM EACH ADJUSTING BOLT AND BACK OFF THE ADJUSTING NUTS.

HAVE 3/16 INCH CLEARANCE HERE. USE THE BRAKE ADJUSTING TOOL AS A GAUGE.

AND, THIS HOUSING SHOULD BE DRAINED EVERY 60 HOURS. IT SHOULD BE DRY.

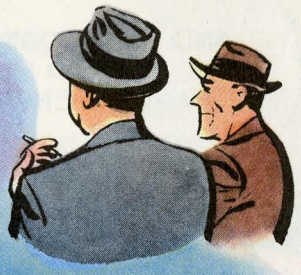


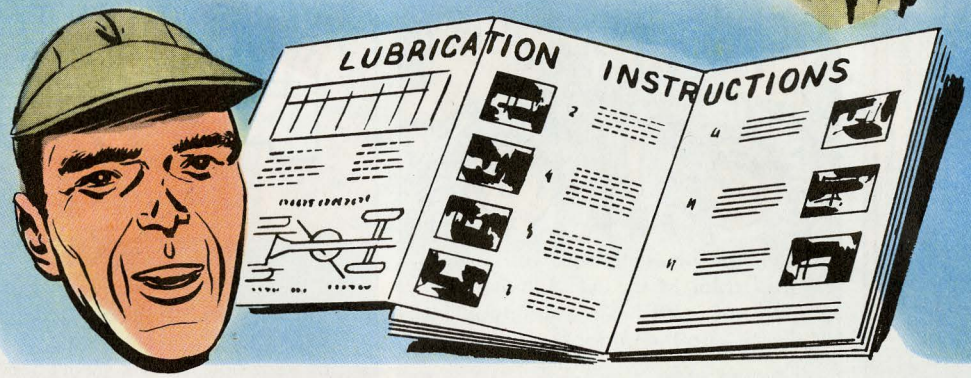
FIRST SECOND THIRD FOURTH

37

" IT IS EXTREMELY IMPORTANT THAT YOUR MACHINE RECEIVE REGULAR

LUBRICATION!

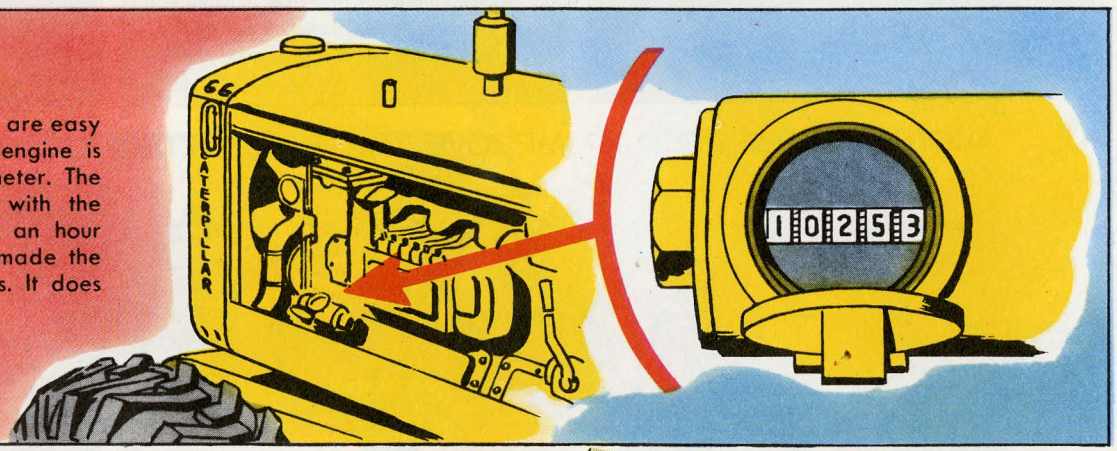




Proper selection of lubricants will add much to machine performance, economy and long life. Your Operator's Instruction Book specifies the lubricant and the weight of lubricant to be used. It shows the points to be serviced and the *hourly service intervals.*

38

The hourly service intervals are easy to figure because every engine is equipped with an hour meter. The hour meter keeps pace with the crankshaft — registering an hour when the crankshaft has made the necessary number of turns. It does not record "clock" hours.



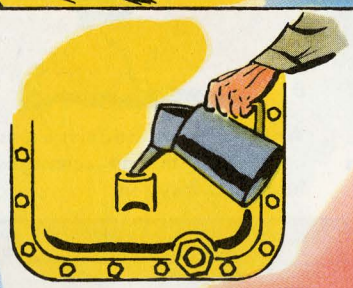
39

HERE ARE A FEW

LUBRICATION POINTS

There are other lubrication points which need your attention. Refer to your Operator's Instruction Book for complete information.

A

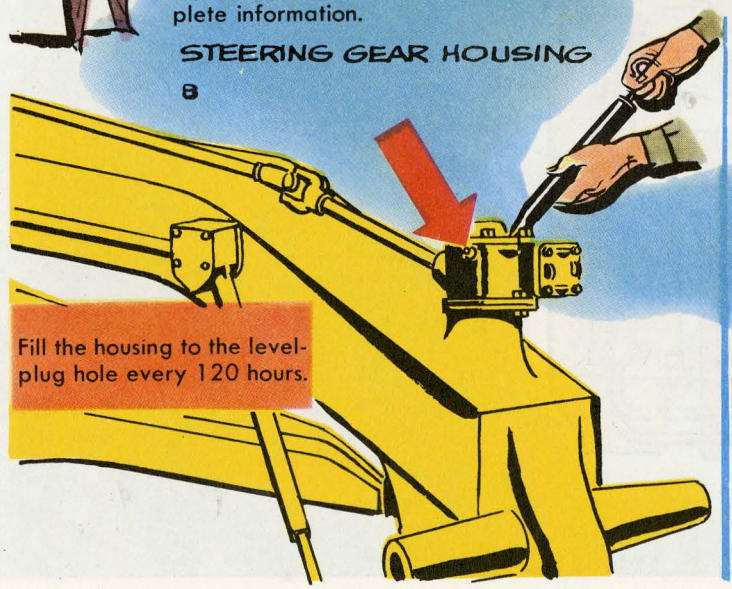


TRANSMISSION AND REAR AXLE HOUSING

Check oil level every 120 hours. Oil should be level with filler opening. Every 900 hours drain and clean the compartment—and fill with clean oil. Clean the filter elements and oil pump screen.

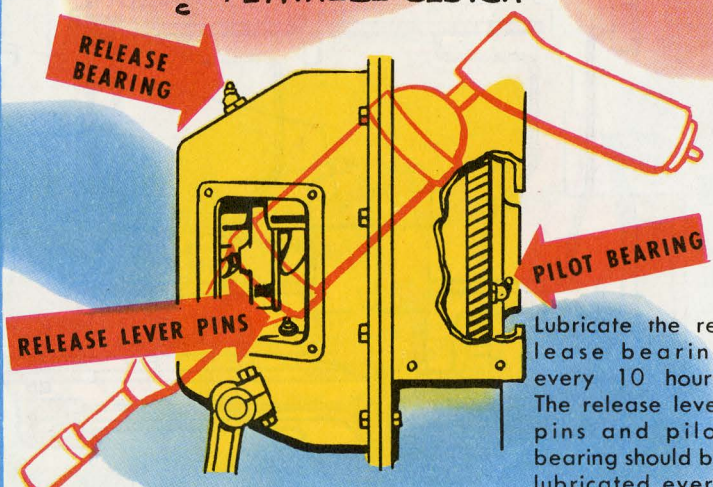
STEERING GEAR HOUSING

B



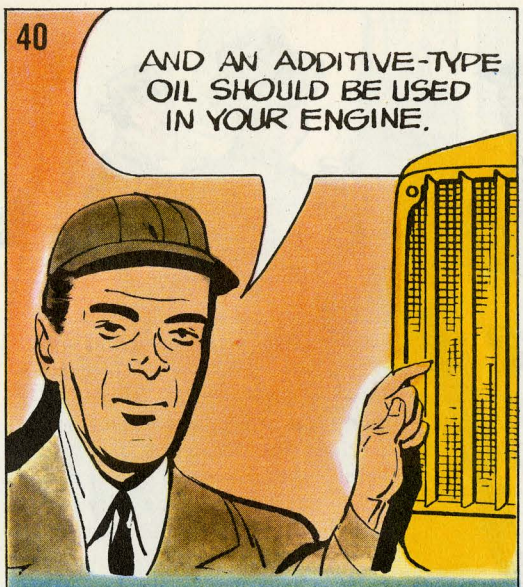
Fill the housing to the level-plug hole every 120 hours.

C FLYWHEEL CLUTCH



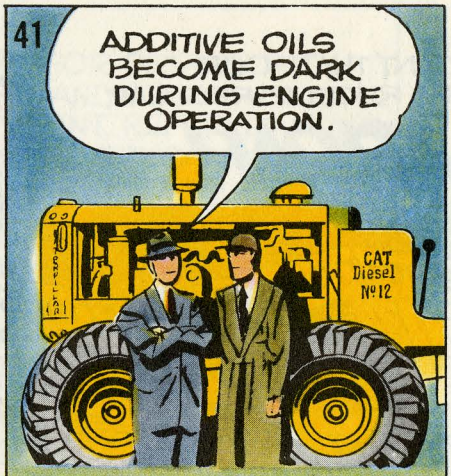
Lubricate the release bearing every 10 hours. The release lever pins and pilot bearing should be lubricated every 240 hours.

40



Lube oil should meet specification MIL-O-2104, or Superior Lubricant Series 2.

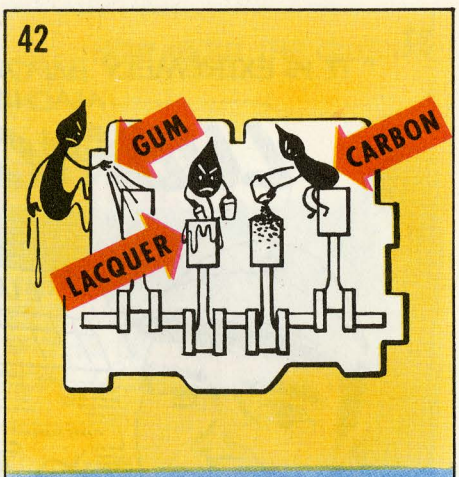
41



Don't become alarmed about the dark color of the oil. *Additive oils* hold soft carbon in suspension in the oil—so the oil looks dark.

Straight mineral oils are unable to hold the carbon in suspension—so these oils do not appear so dark in color.

42



Straight mineral oils are unable to keep the internal working parts of your engine free from carbon, lacquer, and gums.

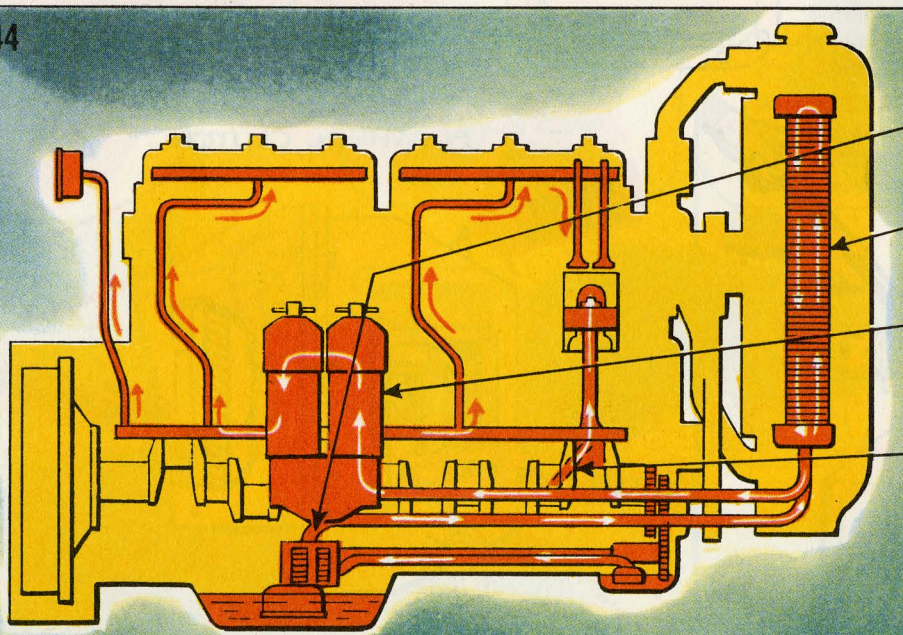
43 ADDITIVES ARE USED TO IMPROVE THE PROPERTIES OF STRAIGHT MINERAL OILS

Detergent additives keep engine parts clean by holding undesirable products in suspension in the oil.

Anti-oxidant additives resist chemical changes in the oil—changes caused by heat and oxygen.

Corrosion-inhibitors protect engine parts from corrosive acids—the result of oil breakdown.

44



A. Oil is pumped from the crankcase to the oil cooler.

B. Here, oil is cooled to retard the breakdown action caused by extreme heat.

C. The oil then passes through filters. "Caterpillar" elements remove abrasive particles as small as 39 millionths of an inch.

D. After filtering, the oil goes to crankshaft main and connecting rod bearings, and then is sprayed under the piston crowns to cool the pistons. The oil is also forced to the timing gears and valve mechanisms.

45

ENGINE OIL SHOULD BE CHANGED AS RECOMMENDED. THIS DEPENDS ON THE DUST IN THE AIR, THE TYPE OF OIL USED - OR THE SULPHUR CONTENT OF YOUR FUEL.

46

When you change oil, be sure to clean the filter housing and replace the high-quality, surface-type element. Use genuine "Caterpillar" filter elements.

If you expect efficient engine operation and long life, your engine must operate at the proper temperature.

COOLING SYSTEM

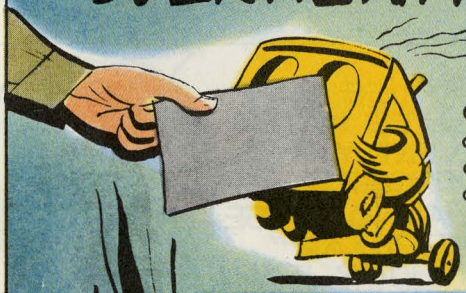
47

NORMAL OPERATING TEMPERATURE RANGES FROM 170° TO 180°F. WHEN THE ENGINE OVERHEATS, THERE IS ALWAYS A CAUSE.

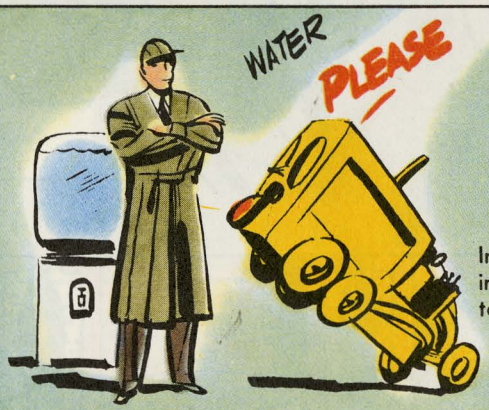
48

A FEW CAUSES FOR

OVERHEATING!



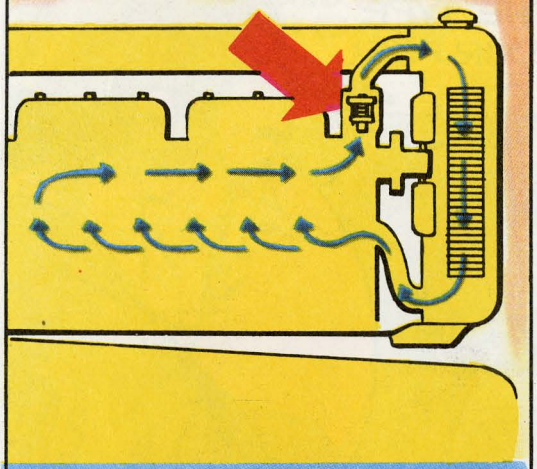
Obstructions in front of the radiator — damaged core from careless cleaning.



Insufficient liquid in the cooling system.

Internal trouble with engine itself.

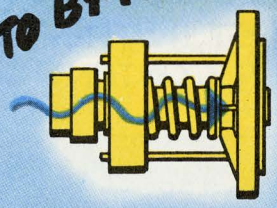
49



The temperature regulator is in the cooling system to keep the temperature above 170° F.

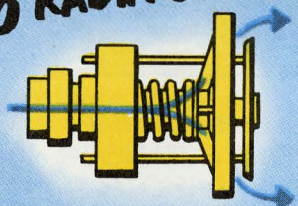
50

TO BY-PASS



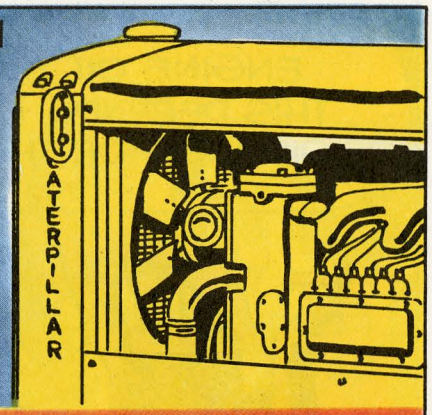
Temperature regulator restricts flow of water to the radiator when the engine is cool

TO RADIATOR



Temperature regulator permits passage of water to the radiator when the engine is hot.

51



Do not run your engine with its vital temperature regulator removed. If it is faulty—replace it.

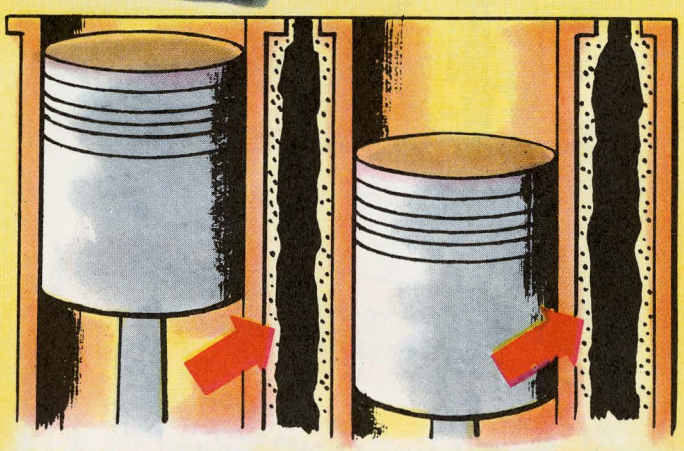
It is as important to prevent *over-cooling* as it is *over-heating*. For minimum wear and maximum life —operate your engine at the proper temperature.

52

SOFT OR TREATED WATER FOR ENGINE COOLING IS YOUR BEST BET ON FREEDOM FROM SCALE AND RUST.

For trouble-free operation, service your cooling system regularly.

53

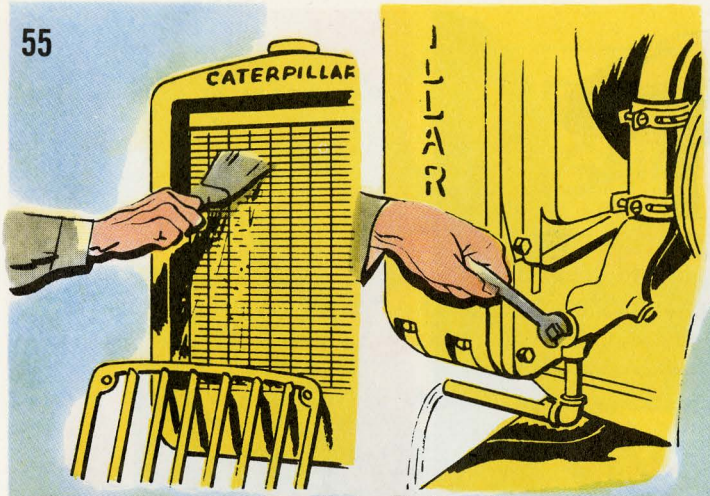


When mineral deposits coat the metal walls inside your engine, the heat cannot get through to be carried off by the water.

54

SO- USE SOFT OR TREATED WATER TO PREVENT MINERAL DEPOSITS. TO ELIMINATE RUST, USE "CATERPILLAR" RUST INHIBITOR. IT WILL RETARD THE FORMATION OF SCALE DEPOSITS.

55



Keep radiator cores clean. Dust deposited between radiator tubes may cause excessively high operating temperatures.

Flush cooling system occasionally. Draining should be at end of day's run when foreign material is in suspension.

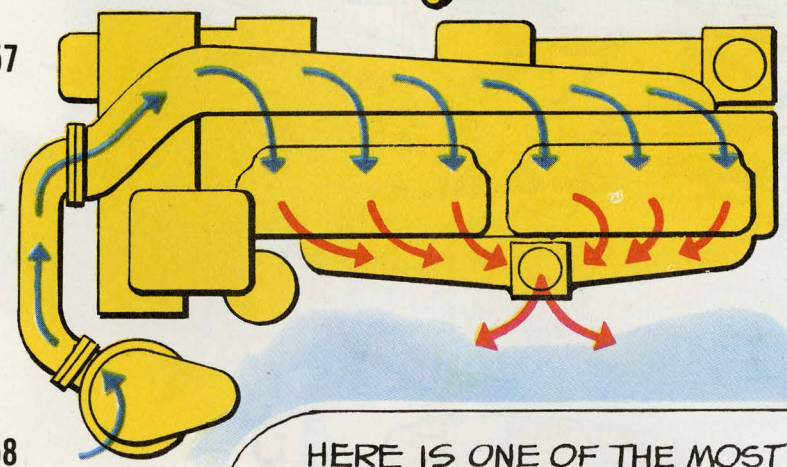
The use of a permanent-type anti-freeze is recommended when temperatures below freezing are encountered.

Keep fan belt at proper tension. When correctly adjusted, you should be able to push the belt in about an inch.

56

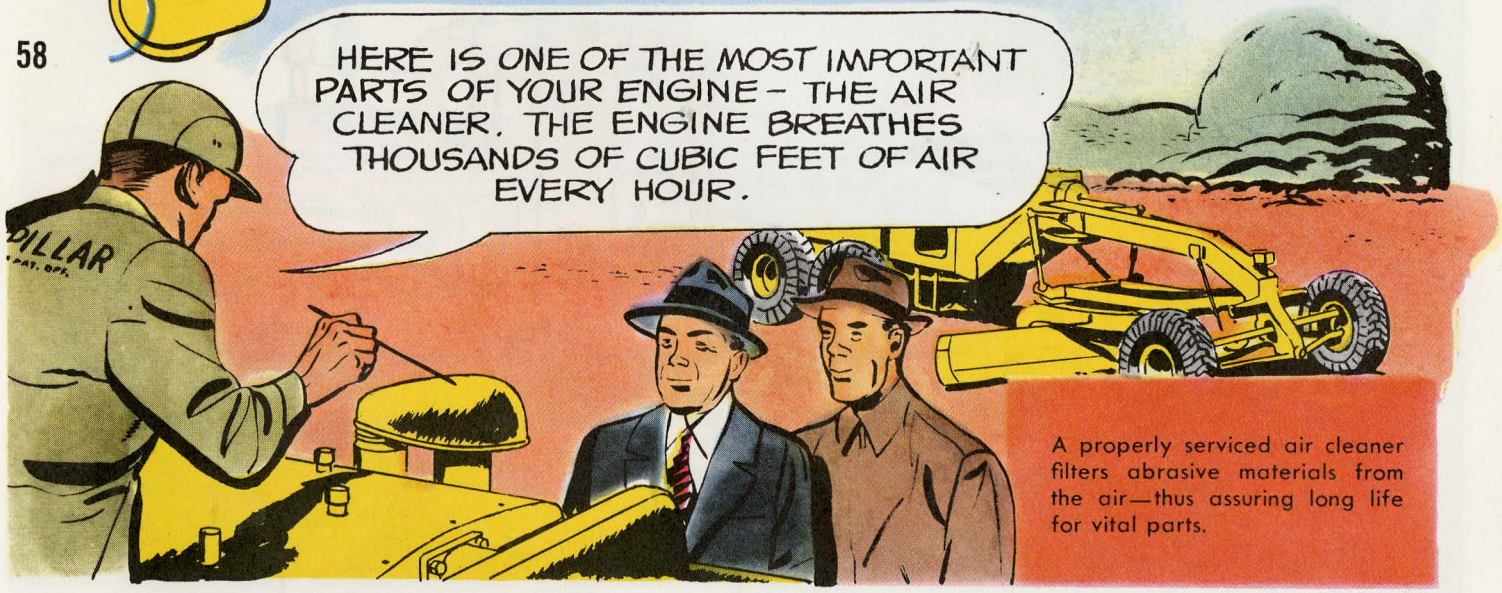
"AND THE AIR INTAKE AND EXHAUST SYSTEMS NEED YOUR ATTENTION TOO!"

57



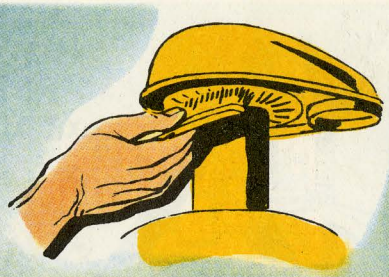
Air passes through the engine by entering at the air cleaner—moving along the intake manifold to the cylinders—then out the exhaust manifold to the exhaust pipe.

58


HERE IS ONE OF THE MOST IMPORTANT PARTS OF YOUR ENGINE - THE AIR CLEANER. THE ENGINE BREATHES THOUSANDS OF CUBIC FEET OF AIR EVERY HOUR.

A properly serviced air cleaner filters abrasive materials from the air—thus assuring long life for vital parts.

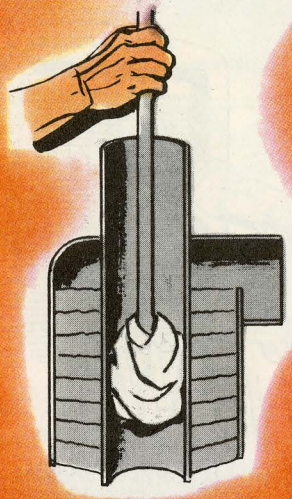
A. Empty the jar when it gets three-quarters full.



B. When they get dirty, wash the pre-cleaner fins with soapy water.

C. Change oil when it shows evidence of being murky, cloudy or thicker than normal.

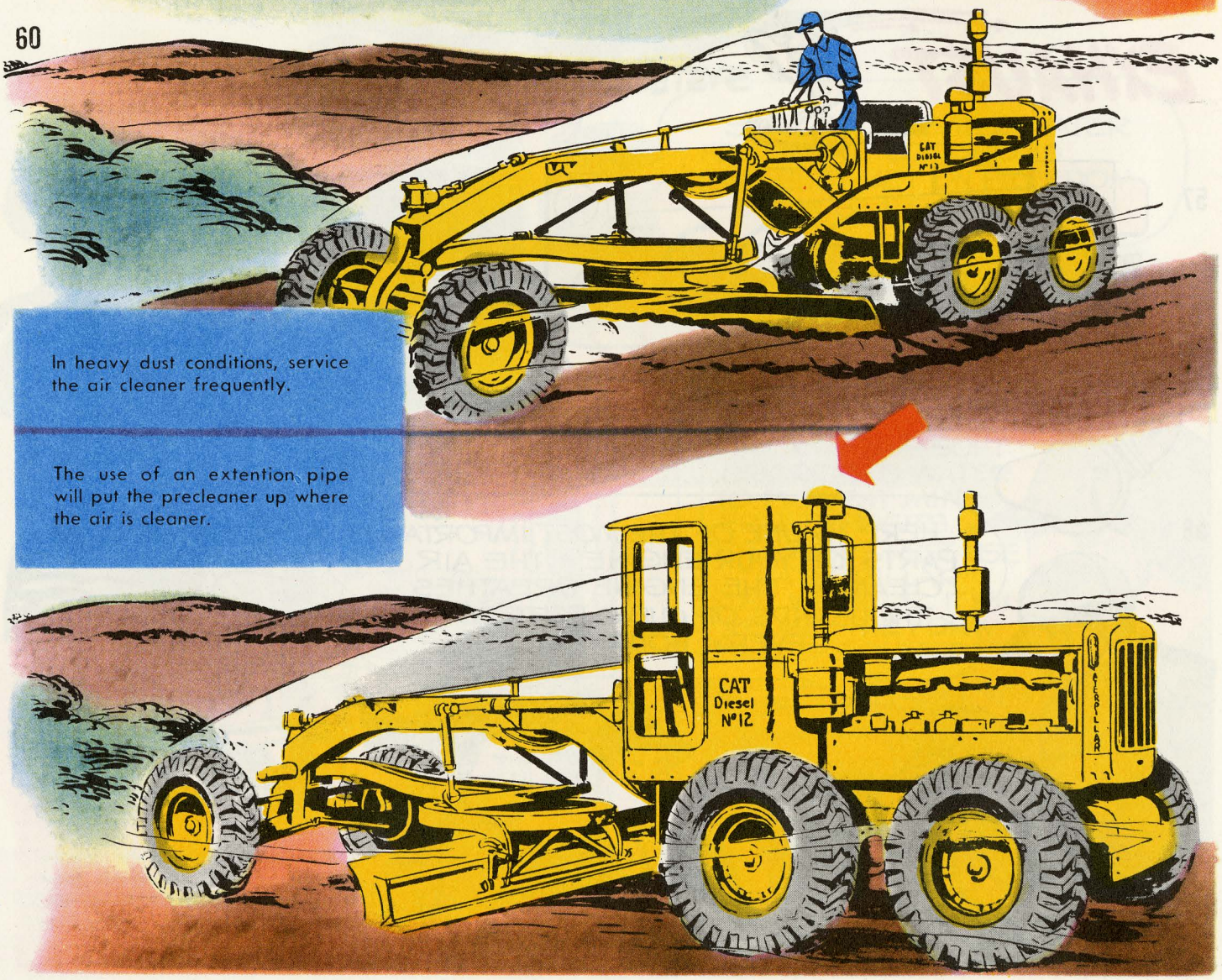
D. Wash screens every 60 to 240 hours, depending upon the dust conditions.



E. Remove the accumulated dirt from inside the air intake pipe. This dirt restricts the opening, thereby reducing the horsepower output.

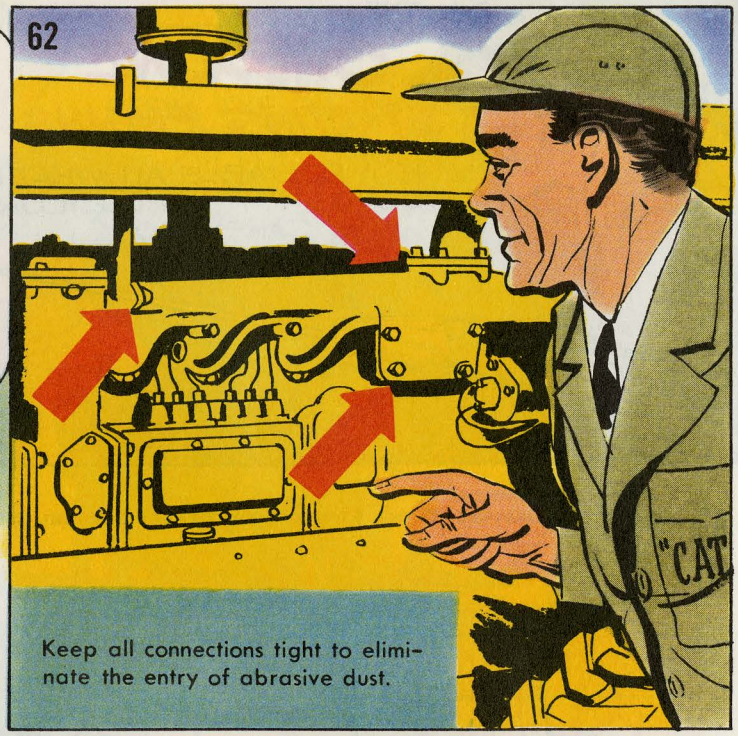
In heavy dust conditions, service the air cleaner frequently.

The use of an extention pipe will put the precleaner up where the air is cleaner.



61

62

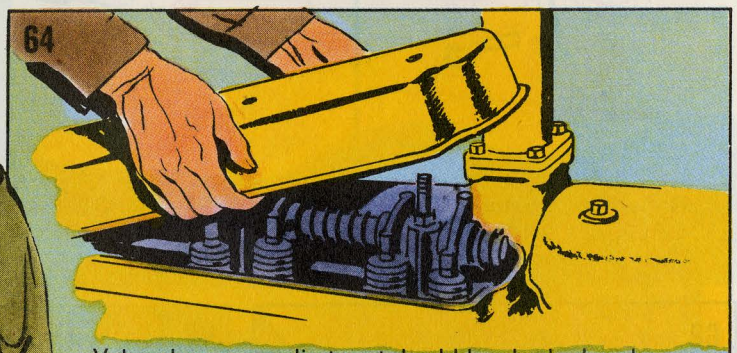


Keep all connections tight to eliminate the entry of abrasive dust.

63

The exhaust outlet should be protected by a "Caterpillar" rain trap so rain and snow cannot get into the engine.

64



Valve clearance adjustment should be checked and adjusted if necessary after every 480 hours of operation. Your engine cannot operate satisfactorily or economically, unless the valve clearances are properly adjusted. Your Operator's Instruction Book gives you the valve settings. To prevent dirt from falling into the engine, clean the valve covers before removing them.

65

CLEARANCE TOO GREAT

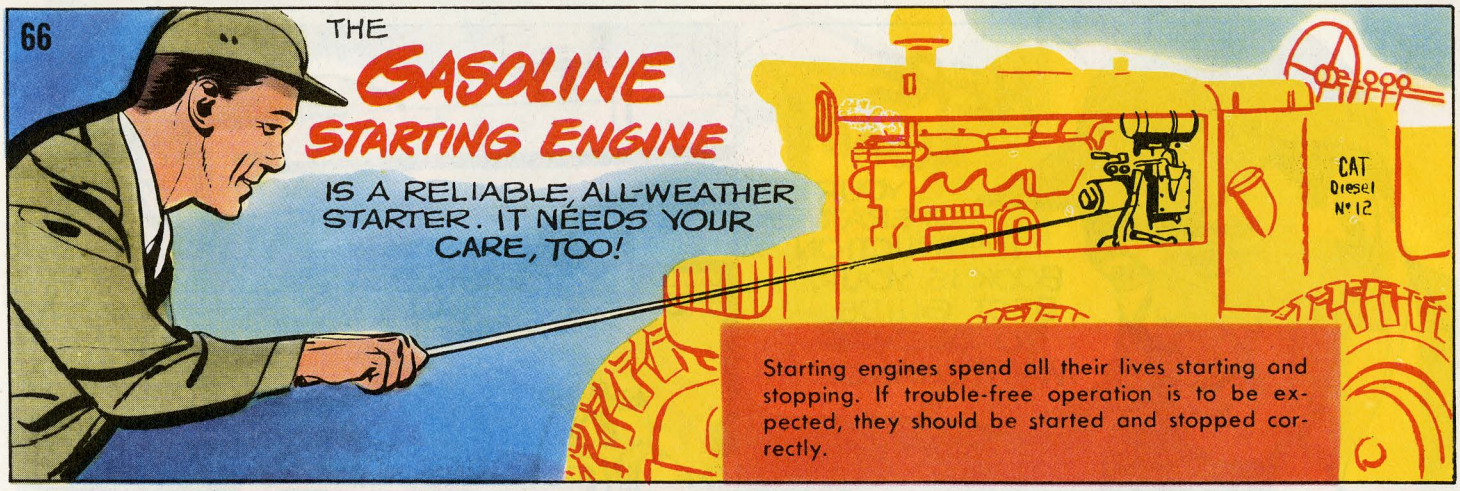
A. Valve closes with excessive impact. Results: valve seats are "beat-in" and valve faces badly worn. Reseating and replacement of parts is necessary.

CLEARANCE TOO SMALL

B. Poor valve seat contact. Results: loss of compression and burned or guttered valve seat surfaces. Valve mechanism suffers serious damage.

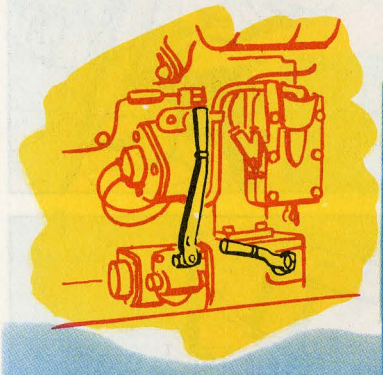
66

THE **GASOLINE STARTING ENGINE** IS A RELIABLE, ALL-WEATHER STARTER. IT NEEDS YOUR CARE, TOO!

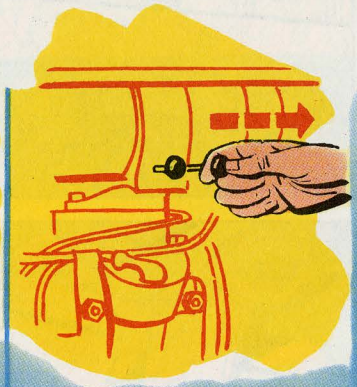


Starting engines spend all their lives starting and stopping. If trouble-free operation is to be expected, they should be started and stopped correctly.

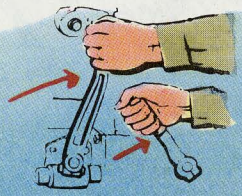
67 TO PREVENT DAMAGE TO THE STARTER PINION OR FLYWHEEL RING GEAR, DO THESE THINGS WHEN STARTING THE ENGINE



A. See that the starting engine clutch and flywheel clutch are disengaged.



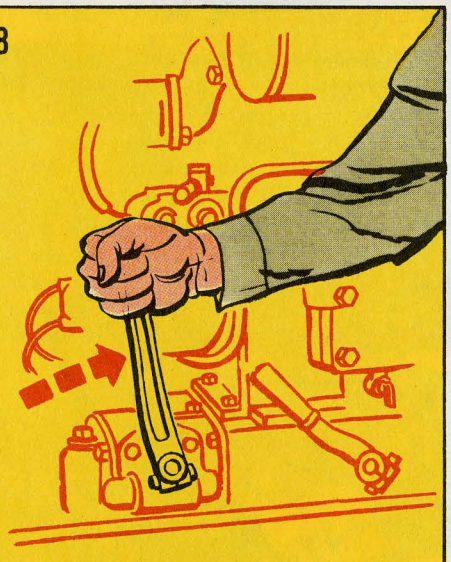
B. See that the starting engine is running at idle speed.



C. Apply the starting engine clutch brake to stop the starter pinion from rotating. Engage the starter pinion with the flywheel ring gear by positioning the starter pinion control lever. Release the clutch brake and engage the clutch.

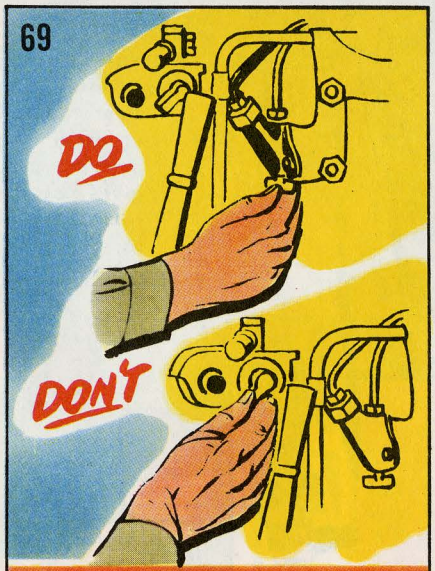
D. Position the throttle control to let the starting engine run at full governed speed.

68



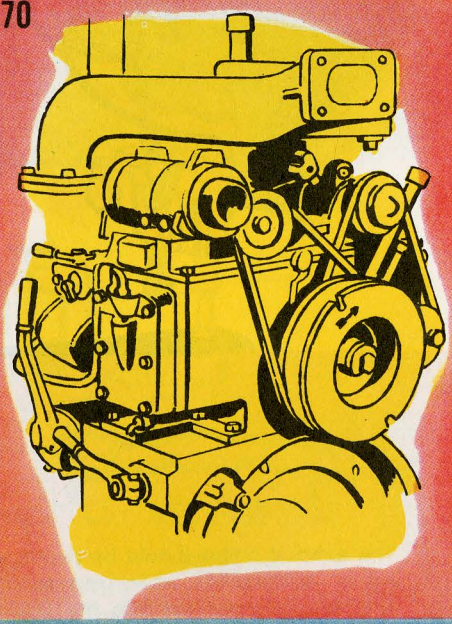
When the Diesel begins to run, disengage the starting engine clutch control lever.

69



It is important to stop the starting engine by turning off its fuel. This drains the carburetor thus prolonging float valve and bearing life. It also eliminates crankcase dilution. *Do not turn off the ignition switch to stop the starting engine.*

70



To get good starting engine performance, you should show it some care, too.

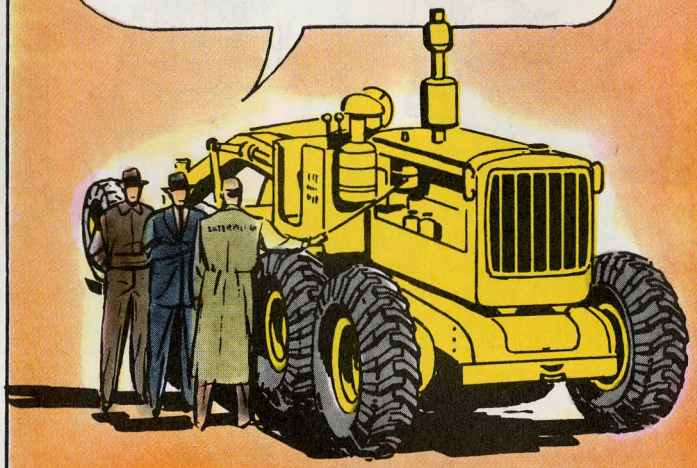
71

YOUR OPERATOR'S INSTRUCTION BOOK PRESENTS DETAILED INFORMATION ON THE ADJUSTMENT OF THESE POINTS.

- √ Carburetor
- √ Magneto
- √ Timing
- √ Starting Engine Clutch
- √ Valve Clearance
- √ Spark Plug

72

WASH YOUR AIR CLEANER, REFILL THE OIL CUP AND CHANGE YOUR LUBRICATING OIL EVERY 240 HOURS.



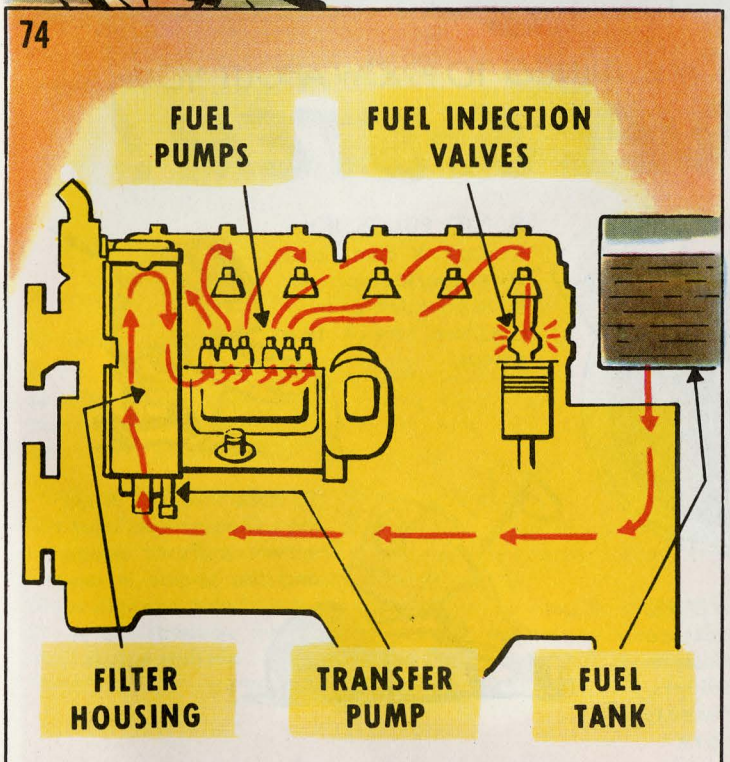
73

THE

FUEL SYSTEM

REQUIRES VERY LITTLE ATTENTION.

74



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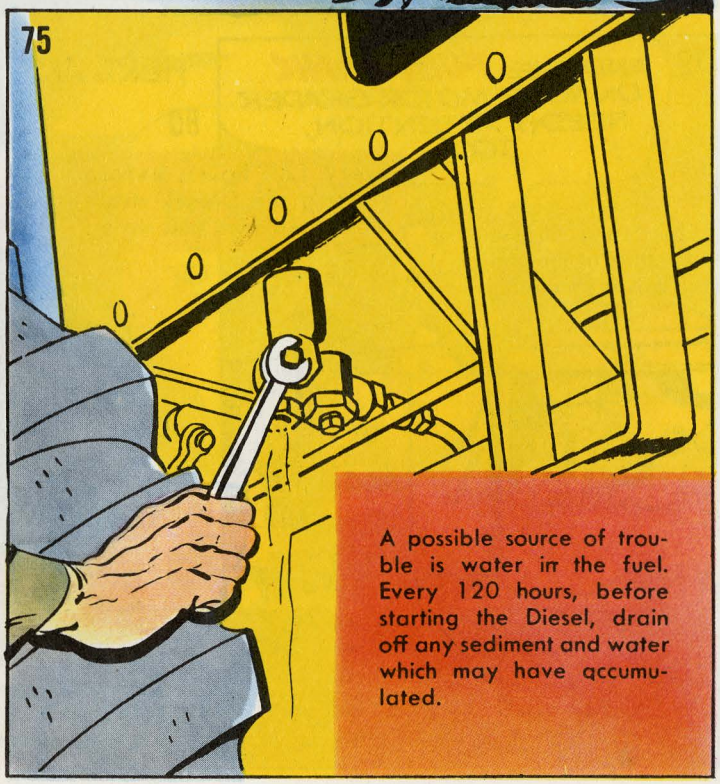
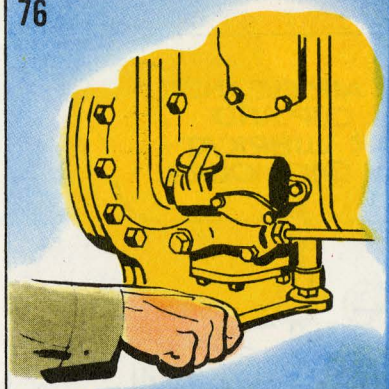
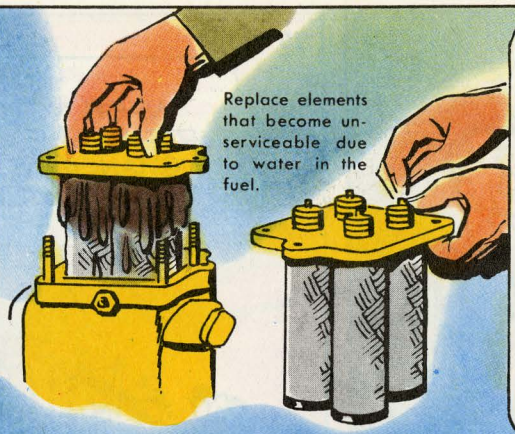


A possible source of trouble is water in the fuel. Every 120 hours, before starting the Diesel, drain off any sediment and water which may have accumulated.

76

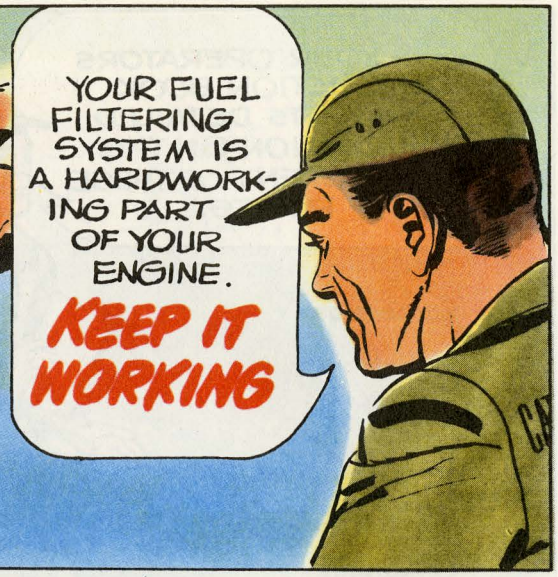


Drain water and sediment which settles to the bottom of the fuel filter housing.

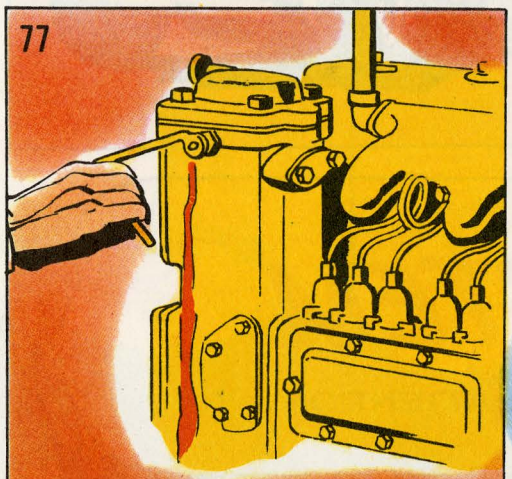


Replace elements that become unserviceable due to water in the fuel.

Water in the filter housing causes filter elements to become soggy and swollen —thus restricting the flow of fuel.



77



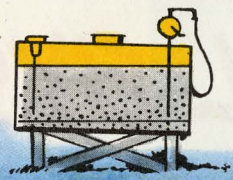
When the fuel supply is broken or air is in the line, the fuel system must be primed.

78

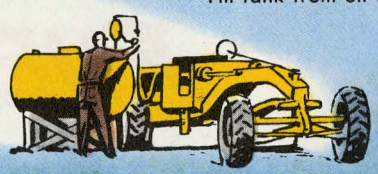
GOOD FUEL STORAGE IS VERY IMPORTANT

Drain off sediment and water before refilling.

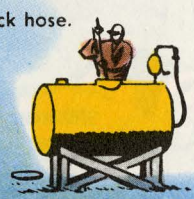
Fill tank from oil truck hose.



To settle-out contaminants, let fuel stand 24 hours.



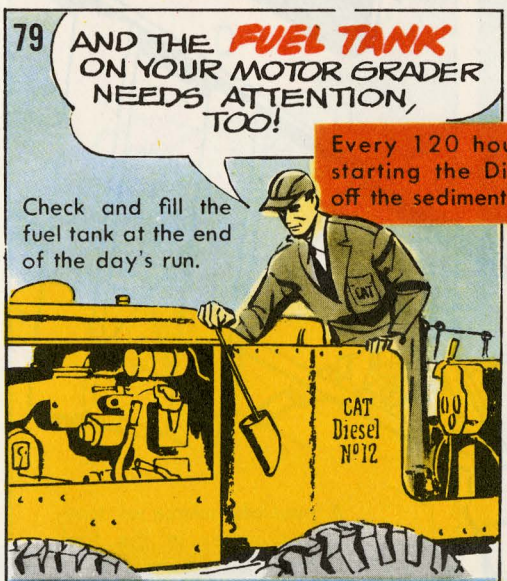
Use pump to draw off fuel.



Clean the tank occasionally.

Keep fuel clean. The best fuels can become unsatisfactory through careless handling or poor storage. It is practically impossible to keep cans, funnels and drums clean. Use good storage tanks and fuel handling practices. Handle your fuel as recommended.

79


AND THE FUEL TANK ON YOUR MOTOR GRADER NEEDS ATTENTION, TOO!
Every 120 hours, before starting the Diesel, drain off the sediment and water.
Check and fill the fuel tank at the end of the day's run.
CAT
Diesel
Nº12

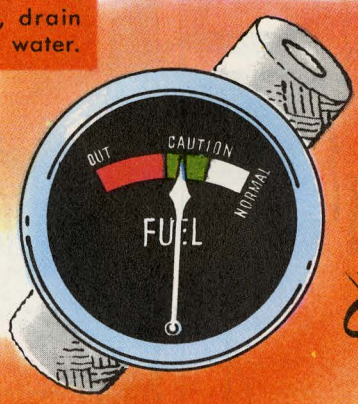
Partially filled tanks sweat—moisture collects on the inside and drops into the fuel.

Consult your Operator's Instruction Book for complete maintenance details.

80

HERE ARE SOME THINGS TO KNOW ABOUT YOUR

FUEL SYSTEM!



A. FILTER ELEMENTS. Check fuel pressure gauge. Low pressure means clogged filters. Replace elements when necessary.

B. FUEL PUMPS. If the exhaust is clear and the engine lacks power, have your dealer serviceman check the pumps.

C. FUEL VALVES. When the exhaust shows intermittent puffs of smoke and the engine is running irregularly —check the injection valves.

81

"COLD WEATHER OPERATION REQUIRES PRECAUTION"

Ordinary cold weather will not cause difficulty in starting or loss in efficiency, if the starting engine and Diesel are in good mechanical condition.

82

COLD WEATHER HINTS

Use thinner lubricating oil during cold weather.

Protect your cooling system with permanent-type anti-freezes.

Refer to your Operator's Instruction Book for information on oils, fuel and cold weather operation of your engine.

83

"THERE ARE SOME GENERAL FACTS WHICH OPERATORS SHOULD KNOW!

DAILY CARE

A. Check for loose nuts, bolts or worn parts. (Particularly the air intake system.)

B. Check the cooling system.

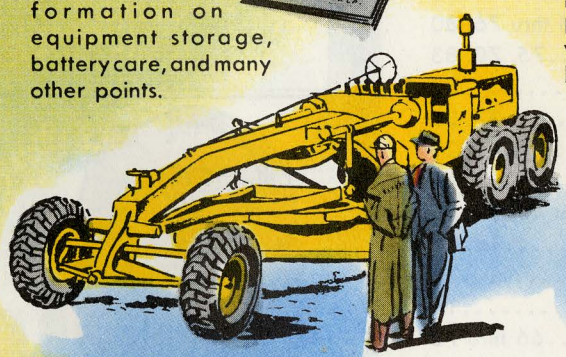
C. Fill the Diesel fuel tank at the end of the day's run.

D. Check hour meter reading to determine the lubrication time for all parts.

E. Clean mud and dust from the motor grader. *Mud and dust are machine enemy number one.*

F. Tip seat cushion but leave top of seat facing the weather. *Do not turn the seat cushion over.*

Your Operator's Instruction Book should be read for full particulars. Refer to it for information on equipment storage, battery care, and many other points.



STOPPING THE DIESEL

After removing the load, idle the engine at half-speed for 5 minutes before stopping. To stop, move the fuel injection pump control lever to the extreme forward position. Place the compression release control lever in the "start" position.

FUEL

Always buy the lowest price fuel giving satisfactory operation.

Working Adjustments.

Keep tires properly inflated. Check operation of brakes and clutches. Intake and exhaust valves should be held to recommended clearances. Check the fan belt adjustment. Keep ball and socket joints in proper adjustment.

Starting and Stopping the Motor Grader.

Start: After the engine has warmed up, press the clutch pedal down. Shift the gears into the speed position required. Pick up the engine speed and release the clutch pedal.

Stop: Push fuel injection pump control lever forward to idling position and disengage clutch. Move gears to neutral position and on the No. 12 and No. 112 place the high speed shift lever in the "high" or "low" speed position. Engage the clutch.

84

WELL, WE'VE COVERED A LOT OF GROUND. I KNOW YOU'RE ANXIOUS TO PUT THIS MACHINE TO WORK - CALL ME IF YOU NEED ME.
THANKS FOR ALL THE INFORMATION. SO LONG!
CAT Diesel N°12

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CATERPILLAR TRACTOR CO., Peoria, Illinois
DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

WEST RIVER EQUIPMENT

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Rapid City, South Dakota
TELEPHONE 4850

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